GAO

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General Accounting Office
Washington, D.C. 20548

Information Management and
Technology Division

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February 23, 1989

The Honorable John Conyers, Jr.
Chairman, Committee on
Government Operations
House of Representatives

Dear Mr. Chairman:

On September 28, 1988, the former chairman of your Legislation and National Security Subcommittee asked us to report on the cost of the Naval Aviation Logistics Command Management Information System (NALCOMIS). In subsequent discussions we agreed to provide (1) a description of NALCOMIS and the acquisition approach being followed, (2) the current status of the program, (3) a description of the cost growth and a comparison of current cost estimates with information provided in budget exhibits to the Congress, (4) the reasons for cost increases, and (5) a description of actions taken by the Office of the Secretary of Defense (OSD) and the Navy to control costs. To expedite our reply it was also agreed that we would not independently verify cost information or the reasons for any cost increases or decreases identified by Navy and OSD officials.

System Description and Status

NALCOMIS was initiated in 1977 to automate record keeping and reporting requirements for aircraft repair, maintenance, and supply activities throughout the Navy and Marine Corps. The Navy expects NALCOMIS to increase aircraft material readiness, reduce administrative costs and inventory loss, improve turnaround time for repairs, provide greater visibility of assets, and free personnel for more productive maintenance and supply duties.

NALCOMIS hardware is being procured through the Navy's Shipboard Non-Tactical Automated Data Processing Program (SNAP) under a fixed-price contract with Honeywell Information Systems. The Assistant Secretary of the Navy (Financial Management) required that NALCOMIS hardware be procured through SNAP to ensure compatibility between NALCOMIS and other Navy non-tactical automated systems that perform activities such as payroll and financial management. NALCOMIS software is being developed by the Navy and Arthur Andersen under a cost-plus-award-fee contract.

NALCOMIS is being developed and deployed in three phases. The Navy adopted the Status and Inventory Data Management System II (SIDMS-II) as phase I. SIDMS-II, which was developed by the Naval Air Forces Atlantic, was designed to automate aircraft repair record keeping on aircraft carriers during deployment. The Navy converted the SIDMS-II software to operate on SNAP hardware and extended this automation to land-based aircraft repair and maintenance activities such as Marine aircraft groups and Naval air stations. According to NALCOMIS program officials, phase I is operational at 33 intermediate maintenance activities on land and at sea. Intermediate maintenance activities maintain and repair parts removed from aircraft at Naval and Marine air stations as well as aircraft-bearing ships.

Because phase I is limited to record keeping functions, it was adopted as an interim system with the understanding that it would be replaced by phase II upon its certification and approval for full deployment. Phase II, which was developed by Arthur Andersen, is intended to fully automate aviation maintenance functions at 32 of the 33 phase I sites, plus an additional 71 intermediate maintenance activities and supply support centers. Phase II is operational at three Marine aircraft groups and is undergoing final testing at a Naval air station.

Phase III, which was also developed by Arthur Andersen, is intended to extend automation to 400 organizational maintenance activities. Organizational maintenance activities maintain and repair parts that remain on the aircraft at Naval and Marine air stations and aircraft-bearing ships. In June 1987, the program office suspended phase III activity indefinitely after 90 percent of the software was developed. A program official told us that funds allocated to complete phase III were shifted to phase II to correct functional deficiencies identified during testing in January and February 1987. Program officials expect to submit a plan to OSD during the second quarter of fiscal year 1989 to complete and implement phase III.

Since 1977, the Navy has expended $233 million to design and develop NALCOMIS and to implement the system at 37 of the more than 500 sites selected to receive NALCOMIS. Program officials estimate total life cycle costs for the system at about $1.4 billion.

OSD Cost Estimates Are Not Comparable

During the Subcommittee's September 13, 1988, hearing on the Navy's Standard Automated Financial Management System, the former chairman requested OSD to identify other automated information systems

experiencing significant cost growth. OSD identified NALCOMIS as one of seven systems that experienced significant cost growth and reported to the Subcommittee that its procurement cost estimate increased from $525 million in 1987 to $614 million in 1988. NALCOMIS program officials told us the cost estimates provided by OSD are not comparable because the 1987 estimate is incomplete. They said the $525 million figure represents estimated procurement costs for only phases I and II, whereas the $614 million figure represents estimated procurement costs for phases I, II, and III. In order to make an accurate comparison, the officials said, estimated phase III costs of $411 million should be included in the 1987 figure for a total 1987 estimate of $936 million. Therefore, according to the program officials, there has been a decrease in estimated procurement costs during this period, from $936 million in 1987 to $614 million in 1988. Program officials said the reduced procurement cost estimate reflects:

- delays in the hardware procurement schedule which, according to program officials, could allow NALCOMIS to benefit from the computer industry trend of decreasing hardware costs over time; and
- a decision to use desktop computers for phase III, which are less expensive than the minicomputers used for phase II and originally planned for phase III.

Program officials told us the NALCOMIS life cycle cost estimate was reduced from about $1.5 billion in 1987 to about $1.4 billion in 1988 to reflect the anticipated lower hardware costs. The 1988 life cycle cost estimate of $1.4 billion was submitted with the 1990-1991 budget exhibit.

Despite the recent reductions in estimated procurement and life cycle costs, program officials acknowledged that NALCOMIS life cycle cost estimates have increased over time. According to these officials, the 1982 life cycle cost estimate of about $1.1 billion is the most reasonable baseline life cycle cost estimate. The officials attributed increases in the cost estimate over the 1982 estimate to a number of factors. For example, the officials said the 1987 and 1988 life cycle cost estimates include costs for five additional sites, software redesign undertaken to correct deficiencies identified in the initial prototype testing, additional functions, and additional project management required under the phased approach.

Efforts to Control NALCOMIS Development

Until July 1986, the Navy had total oversight authority for NALCOMIS and the system was not subject to regular Major Automated Information Systems Review Council (MAISRC) reviews. Organized in the late 1970s, MAISRC is the senior Department of Defense management oversight body responsible for reviewing major resource investments in general purpose, automated data processing systems during development. Representing the Secretary of Defense, the Council, which is comprised of senior OSD officials, decides whether system development efforts should continue or be terminated. According to OSD officials, oversight authority for NALCOMIS was delegated to the Navy because system development had progressed beyond the planning stage when MAISRC was initially established.

During the fiscal year 1986 appropriations process, the Committee on Appropriations was concerned with NALCOMIS' lengthy development and whether it would perform the intended functions. As a result, OSD was directed to conduct a MAISRC review of the system. OSD conducted the review in July 1986 and concluded that the Navy had proper management controls in place and development was on schedule. However, the program office was directed to accelerate the implementation schedule and OSD was requested to keep the Committee advised of the system's progress.

In February 1988, OSD found NALCOMIS to be experiencing further schedule slippage and in March 1988 conducted an on-site review of the system. The review showed that the NALCOMIS implementation schedule had slipped 24 months, and as a result, in June 1988, OSD revoked the Navy's oversight authority for NALCOMIS and transferred it to MAISRC.

NALCOMIS is scheduled for a MAISRC review in the second quarter of fiscal year 1989. During this review, the program office plans to request approval for full deployment of phase II, and present a plan to complete development and implement phase III.

Detailed information on NALCOMIS is contained in appendix I and our objective, scope, and methodology are discussed in appendix II. We conducted our work from October 1988 through December 1988.

As agreed, we did not obtain official agency comments; however, we did discuss the contents of this report with Navy and OSD officials, and their comments have been incorporated.

As arranged with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from its issue date. We will then send copies to the Chairman, Senate Committee on Governmental Affairs, and Senate and House Committees on Appropriations; the Director, Office of Management and Budget; and the Secretaries of Defense and the Navy. We will also make copies available to others on request. Major contributors to this report are listed in appendix III.

Sincerely yours,

Ralph V. Carlone

Ralph V. Carlone
Assistant Comptroller General

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Abbreviations

GAO	General Accounting Office
IMTEC	Information Management and Technology Division
MAISRC	Major Automated Information System Review Council
NALCOMIS	Naval Aviation Logistics Command Management Information System
OSD	Office of the Secretary of Defense
SIDMS-II	Status and Inventory Data Management System-II
SNAP	Shipboard Non-Tactical ADP Program

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Naval Aviation Logistics Command Management Information System (NALCOMIS)

NALCOMIS Brings Automation to Navy Aircraft Repair and Maintenance

NALCOMIS is an automated management information system for aircraft maintenance and material management activities throughout the Navy and Marine Corps. Its objectives are to automate record keeping and reporting requirements for shipboard and land-based aircraft repair, maintenance, and supply functions. For example, NALCOMIS will maintain a repair history for each aircraft, track inventory levels at supply centers, and automate Naval aviation repair and maintenance manuals. According to program officials and Navy documents, NALCOMIS has not changed objectives since its inception in 1977.

In addition to automating the Naval Aviation Maintenance Program, NALCOMIS will address deficiencies in aircraft repair and maintenance activities identified by the Navy. The deficiencies are:

- lack of timely management information,
- difficult data collection processes, and
- inadequate reporting.

NALCOMIS is being developed and deployed in three phases. Phase I partially addresses the objectives and deficiencies by automating the extensive record keeping associated with aircraft maintenance and repair and providing managers with timely information on repair transactions. Because Phase I does not completely address all three deficiencies, its implementation has been limited to 33 sites[1] and the Navy plans to eliminate it when phase II becomes operational. Phase II is expected to address the objectives and all three deficiencies by fully automating aviation maintenance data collection, supply requisition, and inventory processes, as well as other ancillary functions. Phase II will be implemented at 103 intermediate maintenance activities and supply support centers.[2] Intermediate maintenance activities perform maintenance and repairs on parts removed from aircraft at Naval and Marine air stations as well as aircraft-bearing ships.

Phase III is designed to extend automation to 400 organizational maintenance activities that perform maintenance and repairs on parts that remain on the aircraft at Naval and Marine air stations and aboard aircraft-bearing ships. Program officials told us phase III will interact with phase II at the intermediate maintenance activities and supply support centers.

[1]Sites include aircraft carriers, Marine aircraft groups, and Naval and Marine air stations.

[2]The 103 phase II sites include 32 of the 33 phase I sites plus an additional 71 intermediate maintenance activities and supply support centers.

Navy documents and program officials state that implementation of NALCOMIS will result in the following benefits:

- increase aircraft material readiness,
- reduce administrative costs, paperwork, and inventory loss,
- improve turnaround time for repairs,
- provide greater visibility of assets, and
- free personnel for more productive maintenance and supply duties.

Chronological History and Acquisition Approach

NALCOMIS has experienced a lengthy development that program officials primarily attribute to early software design failures and delays in awarding a hardware contract. According to one program official, NALCOMIS did not get on a successful track until after the 1984 decision to adopt a three-phased approach.

In February 1977, the NALCOMIS concept was approved and the Assistant Secretary of the Navy (Financial Management) decided that NALCOMIS hardware would be procured through the Shipboard Non-Tactical Automated Data Processing Program (SNAP) to ensure compatibility among the Navy's non-tactical information systems that perform activities such as payroll and financial management. Full scale development and prototype testing was approved in January 1979. However, in the third quarter of fiscal year 1979 it was recognized that, because of delays in awarding the SNAP contract, hardware for NALCOMIS would not be available for at least 18 months.

In 1979, the NALCOMIS program office directed the Fleet Material Support Office to begin NALCOMIS software development on available hardware rather than wait for award of the SNAP contract. The program office also decided that when the SNAP hardware became available the software would be converted. By the second quarter of fiscal year 1981 a significant portion of the original NALCOMIS software was developed and in January 1982 a software conversion contract was awarded to CACI.[3] The SNAP fixed-price contract was awarded to Honeywell Information Systems in June 1982 for DPS 6 computers. The contract provides for maintenance and upgrades through 1992. In July 1983, a prototype version of NALCOMIS, using the contractor-converted software and Honeywell hardware, was set up at a Marine aircraft group. During testing, the prototype failed to meet its production and response-time requirements.

[3]Originally the Navy planned to develop and implement NALCOMIS as a single phase.

According to Navy documentation, the problems were caused by inefficient software and a data base design that failed to take full advantage of inherent Honeywell DPS 6 capabilities. After considering alternative solutions, Navy officials concluded that redesigning the software represented the least costly alternative. In 1984, the Navy authorized a competitive contract for software redesign and in January 1985 a cost-plus-award-fee contract was awarded to Arthur Andersen.

In 1984, the Navy also approved a three-phased approach to NALCOMIS implementation so that some benefits could be realized prior to full implementation. While NALCOMIS was being developed, tested, and redesigned, the Commander, Naval Air Forces Atlantic, deployed the Status and Inventory Data Management System II (SIDMS-II) on selected aircraft carriers to meet aircraft repair record keeping needs. Additionally, the Navy Management Systems Support Office converted the SIDMS-II software to run on SNAP hardware. As a result, SIDMS-II was adopted as NALCOMIS phase I and deployed to intermediate maintenance activities between fiscal years 1985 and 1988. Arthur Andersen was responsible for developing phases II and III.

Current Status

According to 1988 estimates, the Navy has spent approximately $233 million to develop and implement NALCOMIS at 37 of a possible 500 planned sites. Of this $233 million, $206 million was spent on procurement and $27 million on operation.

Phase I is currently operational at 33 sites. When phase II is approved for full deployment and funding, the Navy plans to convert 32 of the 33 sites to phase II software. Phase II is expected to operate on the same hardware as phase I, augmented with additional terminals and printers. The remaining site will not be converted to phase II because it is an aircraft carrier scheduled to be decommissioned.

Phase II, which was granted approval for limited deployment in June 1987, is currently operational at four sites—three Marine aircraft groups and 1 Naval air station. Phase II received limited deployment approval after testing in January and February 1987 indicated a need for additional phase II functions such as balancing inventory stock levels. The three Marine aircraft groups have fully tested and approved phase II software. The Naval air station, which implemented phase II in September 1988, is currently testing additional system capacity that is not required by Marine air groups. According to program officials, Naval air stations generally handle a larger volume of aircraft maintenance

and repair transactions than Marine aircraft groups and therefore require greater system capacity. As a result, phase II is being tested at a large naval air station to ensure that it meets capacity requirements. Phase II will be submitted to the Navy for full deployment approval in the second quarter of fiscal year 1989.

Arthur Andersen had completed 90 percent of phase III software development when the program office suspended phase III activity in June 1987. According to program officials, funds allocated for phase III completion and implementation were shifted to phase II to correct functional deficiencies, such as the inability to maintain inventory balances, identified during testing in January and February 1987. The program office will submit a plan to complete development and implement phase III during a Major Automated Information System Review Council (MAISRC)[1] review of NALCOMIS scheduled for the second quarter of fiscal year 1989. A program official told us the plan will include a proposal to run phase III software on less expensive, desktop computers rather than the minicomputers used for phase II. Program officials also told us the Arthur Andersen contract expired in December 1988 and they expect a subsequent maintenance contract to be awarded in fiscal year 1989.

Office of the Secretary of Defense Cost Estimates Are Not Comparable

During the Subcommittee's September 13, 1988, hearing on the Navy's Standard Automated Financial Management System, the former chairman requested the Office of the Secretary of Defense (OSD) to identify other major automated information systems experiencing significant cost growth. OSD identified NALCOMIS as one of seven systems that experienced significant cost growth and reported to the Subcommittee that its procurement costs increased from $525 million in 1987 to $614 million in 1988. Program officials told us the cost figures provided by OSD are not comparable because the 1987 estimate of $525 million is incomplete, representing only phase I and II procurement costs, whereas the 1988 estimate of $614 million is complete, representing phase I, II, and III procurement costs. The correct 1987 estimate should be $936 million, which represents procurement costs for all three phases. Therefore, according to program officials, NALCOMIS procurement cost estimates did not increase between 1987 and 1988, but rather decreased, as shown in table I.1.

[1]Organized in the late 1970s, MAISRC is the Department of Defense's senior oversight body for reviewing major resource investments in general purpose, automated data processing systems during development. Representing the Secretary of Defense, the Council, which is comprised of senior OSD officials, decides whether system development efforts should continue or be terminated.

Table I.1: NALCOMIS Procurement Costs

Dollars in millions

	Phases I-II	Phase III	Total
1987 Estimate[a]	$522.8[b]	$413.6	$936.4
1988 Estimate[a]	$506.7	$107.9	$614.6[b]

[a]Program officials traced the estimates to a 1987 economic analysis and a revised 1988 economic analysis. OSD requested that the program office revise the 1987 economic analysis as a part of the MAISRC review scheduled for the second quarter of fiscal year 1989.

[b]Program officials believe these figures were "rounded" to $525 million and $614 million.

Program officials noted that total life cycle cost estimates also decreased between 1987 and 1988, as shown in table I.2.

Table I.2: NALCOMIS Life Cycle Costs

Dollars in millions

Cost Category	1987 Estimate	1988 Estimate
Procurement Cost	$936.4	$614.6
Operating Cost	604.6	772.8
Life Cycle Cost	$1,541.0	$1,387.4

Program officials provided two primary reasons for reductions in the NALCOMIS life cycle and procurement cost estimates between 1987 and 1988. First, procurement of hardware has been postponed by several years because of software development delays and funding constraints. As a result, program officials have reduced hardware costs to reflect the computer industry trend toward lower hardware costs over time. Second, in August 1988, the program office decided to use desktop computers for phase III instead of minicomputers. A program official told us desktop computers are traditionally less expensive than minicomputers and, as a result, the 1988 cost estimates reflect reduced hardware costs.

Despite the recent reductions in estimated procurement and life cycle costs, program officials acknowledged that NALCOMIS life cycle cost estimates have increased over time. According to these officials, the 1982 life cycle cost estimate of about $1.1 billion is the most reasonable baseline life cycle cost estimate.[1] The officials attributed increases in the cost estimate over the 1982 estimate to a number of factors. For example, the officials said the 1987 and 1988 life cycle cost estimates include costs for five additional sites, software redesign undertaken to correct

[1]The officials told us this estimate should not be used in a direct comparison with the 1987 and 1988 estimates because it was derived under the Automated Data Systems life cycle cost requirements which are different from the current System Decision Paper life cycle cost requirements used to derive the 1987 and 1988 estimates.

deficiencies identified in the initial prototype testing, additional functions, and additional project management required under the phased approach.

NALCOMIS program officials also told us the life cycle cost estimate of $911.5 million contained in the 1988-1989 Budget Exhibit 43A, was understated because it only included phase I and II costs. If phase III costs were included, the correct life cycle cost estimate would have been about $1.5 billion. Program officials noted that the draft 1990-1991 exhibit 43A contains a life cycle cost estimate of about $1.4 billion, which includes phase III costs and reflects the 1988 reductions in procurement cost estimates.

OSD and Service Activities to Control NALCOMIS Development

Until July 1986, NALCOMIS had not been scheduled for regular MAISRC reviews by OSD. The system was exempted from OSD review because it had progressed past the initial planning stages when MAISRC was established in the late 1970s. Oversight authority for NALCOMIS was delegated to the Navy and performed by the Naval Air Systems Command. The program office briefed the Command on the system's progress every 4 to 6 months from 1977 on, and held the last briefing in October 1988. The program office also submitted annual reports to the Assistant Secretary of the Navy.

During the fiscal year 1986 appropriations process, the Committee on Appropriations was concerned with NALCOMIS' lengthy development and whether the system would perform the intended functions. As a result, OSD was directed to conduct a MAISRC review of the system. The review was conducted in July 1986, and concluded that the Navy had proper management controls in place and that project development was on schedule. The review also showed that full implementation would be delayed by 4 years from 1992 to 1996, and the council advised the Navy to develop an implementation strategy supporting program completion in 1993 consistent with the Navy's funding priorities. The Committee also requested to be kept advised on the system's progress.

In February 1988, OSD found NALCOMIS to be experiencing further schedule delays and conducted an on-site review in March 1988. The review showed that the NALCOMIS implementation schedule had slipped 24 months and, as a result, in June 1988, OSD revoked the Navy's oversight authority for NALCOMIS and transferred it to the MAISRC. In addition, the program office was asked to prepare for a MAISRC review in August 1988. The review was delayed and rescheduled for the second quarter of fiscal year 1989 to include final phase II software testing results.

Appendix II

Objective, Scope, and Methodology

Concern about reported cost growth in the Naval Aviation Logistics Command Management Information System (NALCOMIS) prompted the former Chairman, Subcommittee on Legislation and National Security, House Committee on Government Operations, to ask us to provide information on NALCOMIS. In subsequent discussions with the Chairman's office, we agreed to provide a description of the

- system and the acquisition approach being followed,
- current status of the program,
- cost growth and a comparison of current cost estimates with information provided in budget exhibits to the Congress,
- reasons for any cost increases, and
- actions taken by the Office of the Secretary of Defense and the Navy to control costs.

We interviewed Navy officials responsible for program management, system oversight, and budget development. We also observed the system's implementation status and operational performance at two operating sites. We reviewed system life cycle management documentation, relevant budget documents, and correspondence concerning the management and direction of the NALCOMIS program. Our work did not include an independent assessment of the accuracy of Navy cost estimates or the reasons provided by Navy and OSD officials for any cost increases or decreases.

We conducted our work from October 1988 through December 1988 at Navy and Defense headquarters offices in Washington, D.C., and the NALCOMIS project office in Crystal City, Virginia. The principal headquarters offices included the Naval Data Automation Command, the Chief of Naval Operations, and the Office of the Assistant Secretary of Defense (Comptroller). The two operating sites we visited were Naval Air Stations in Norfolk and Virginia Beach, Virginia. As agreed, we did not obtain official agency comments; however, we did discuss the contents of this report with Navy and OSD officials and their comments have been incorporated.

Appendix III

Major Contributors to This Report

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Fact Sheet for the Chairman, Committee on Government Operations, House of Representatives

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Naval Aviation Logistics Command Management Information System

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